Evaporation Mitigation Technology (EMT) Manufacturers Liaison Report

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1 Nylex Water Solutions – WaterSavr monolayer

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A new applicator for applying WaterSavr chemical monolayer has been developed by Nylex Water Solutions. The applicator relies on a compressed air system for delivery of the WaterSavr powder which is delivered just below the water surface through a tube. The instrument was successfully demonstrated for the first time in Australia at USQ Toowoomba in the presence of David Verlee (Vice President of Business Development, Water Savr Global Solutions Inc, Richmond, Canada and Greg Phillips, Northern Regional Manager, Nylex Corporation. The applicator was first trialed at Byrock (80km south of Bourke, NSW) by Brendon Mason, Nylex Water Solutions.

Figure 1 Nylex WaterSavr trials at Byrock

Figure 2 Nylex compressed air applicator

Figure 3 Nylex WaterSavr product being delivered as a dry powder just below water surface

Figure 4 Spreading (ionic repulsion ?) of calcium hydroxide carrier as it slowly dissolves and spreads away from initial distribution point on bank

Figure 5 Spreading of the powder from initial distribution point away from the bank

Figure 6 A few minutes later when most of the calcium hydroxide powder has dissolved.

Further trials have taken place at KorongVale and Pakenham (northern Vic). The OFB applicator worked well overall proving to be highly successful with applying the WaterSavr powdered product. Application can be automated to frequently apply the product to better maintain the integrity of the monolayer.

Three water loss methods were used :

1. Ultrasonic height sensor located above the water - reading every second and recording a median every hour. The data is logged at distance from the water.

2. Manually read a height indicator - eg twice a week.

3. The “Bucket Method” .

The Bucket Method produced the best results. A ruler is secured inside and outside a 10L clear bucket and an amount of water was added to fill the bucket to a level 25

mm from the top. The bucket is placed on a horizontally flat base with 25mm of the bucket wall protruding out of the water. The water height inside and outside of bucket is monitored every couple of days - topping up bucket level to be the same as the water in the reservoir.

Trials at Byrock (NSW) in January suffered operational problems due to very high temperatures. The electronics, the product and Brendon all struggled ! The trials were indicating an approximate 18% evaporation saving before the trial was aborted because of rain.

More successful trials using the bucket method were run Korong Vale (Coliban Water in Northern Victoria) for 3 -4 weeks to measure reservoir loss (seepage plus evaporation) and this was simply compared to the loss in the bucket (evaporation only). No water was taken from the dam. The exercise was then repeated applying WaterSavr to reduce evaporation assuming the same rate of seepage previously established.

The applicator was installed at the water's edge and aerated WaterSavr transferred to just below the water surface 15 to 20 m from the waters edge. One applicator applied 0.33 kg/Ha per day to the reservoir. The trial demonstrated that for reservoirs up to 10 hectares in size and roughly circular in shape, one applicator would be satisfactory. Two applicators might be required if the shape of the reservoir was long and thin.

Work has commenced on producing a mobile OFB applicator. Plans are underway to install an applicator to a kayak and to tow it via GPS navigated boat around the water body. This would allow compensation for local weather conditions. Brendon is currently moulding the Kayak (Nylex has several tools to utilise) and fitting it out over the next few weeks with the team from OFB. Brendon would envisage that WaterSavr might be applied once or twice daily using this method - at a reduced rate per application to still provide a total of 0.33 kg per Ha per day.

nylex Water Solutions

Coliban WATER for life

Korong Vale WaterSavr™ Project Report

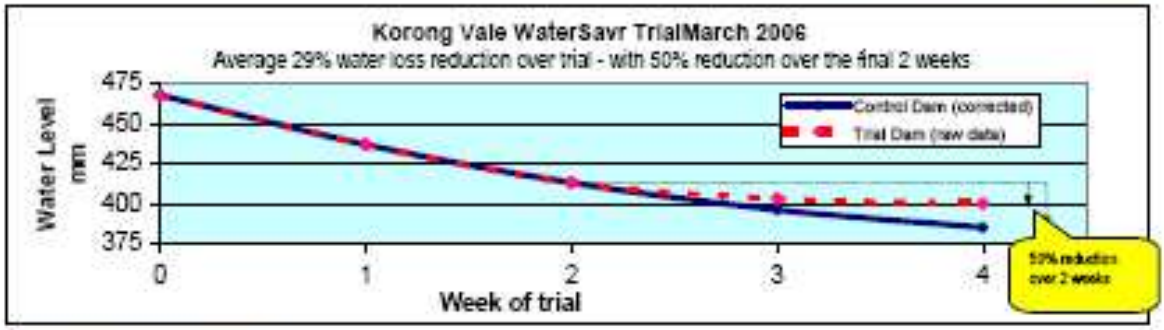
THE PROJECT

Coliban Water operate the Korong Vale potable water supply reservoirs that loose 1.9 m of water to evaporation per annum. This water loss must be reduced to guarantee water supply to several regional towns. Coliban Water elected to trial WaterSavr™ on one reservoir to assess if the product could solve their evaporation problem.

WaterSavr™ is an easy to apply monolayer forming product that was developed by **Flexible Solutions**, Canada, to reduce water evaporation. The product is composed of food grade components and has NSF and UN Sustainable Technologies approvals.

WaterSavr™ was applied daily at 0.33 kg per hectare over a three week trial and the water levels of the trial reservoir and untreated "control" compared.

The automated WaterSavr™ applicator was developed by the **OFB Corp** (Brisbane). It holds 25 Kg of powder, is powered by compressed air and can be left in the field on a 2 Hectare dam for a month before it needs recharging.



Self spreading WaterSavr™

THE SOLUTION

WaterSavr™ application reduced water loss by an average of 29% with 50% water loss achieved over two weeks.

55,000 kL of water evaporation could be saved at Korong Vale's 10 hectares every year using WaterSavr™ assuming only a 29% evaporation reduction. Up to 95,000 KL could be saved using the 50% water loss reduction achieved over 2 weeks of the trial.

Figure 7 Media release information issued by Nylex Water Solutions summarising the findings obtained at the Kurong Vale trial site in Northern Victoria

2 Lotus Quimica Ambiental (fatty alcohol mixture)

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Marcos is located in Brazil and has been trialling a new monolayer product. Lótus Química Ambiental Ltda (Lótus Environmental Chemistry) was created in 2003 and is a small company located at the Business Incubator Center of the University of São Paulo. Marcos completed his post-doctoral studies there in January 2004. The company was created with the assistance of a technological innovation grant approved by the Brazilian Financial Agency FAPESP.

Figure 8 Trials carried out by Marcos Gugliotti in Brazil

The Lotus product is a mixture of fatty alcohols and limestone (low solubility carbonates and oxides, commonly used in agriculture). It is different from Watersaver product, which is a mixture of fatty alcohols and $Ca(OH)_2$.

So far Marcos has carried out tests in laboratory (petri dishes and trays) in addition to outdoor tests in small tanks and reflecting pools made if impermeable concrete. The loss by evaporation was determined directly by measuring the changes in the water level using a still well and a hook micrometer. A test also took place on a large scale reservoir to further investigate spreading and environmental impact. Ecotoxicity tests have demonstrated that the product is safe to the environment.

Marcos has two patent applications, but the product is not in the market yet. Other tests in Brazil will be carried out in the next few months on small reservoirs in collaboration with a government agency. However, he does want to test the product in larger reservoirs. The project will end in March 2007 and he intends to produce one tonne of product for large scale reservoir tests. Marcos intends to visit Australia and the NCEA in the near future.

3 Ciba Speciality Chemicals – PAM

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Conversations with Andrew McHugh have addressed future possibilities of collaborative research between Ciba, NCEA(USQ), UNE and CRC-IF. Research needs to take place to quantify the evaporation reducing effect of PAM and other polymer chemicals. Polymers may work on their own or in combination with cetyl alcohol based chemical monolayers. The polymer might enhance resistance to wind shear breaking up the coverage of the chemical. Dr Geoff Barnes (UQ) would be the lead chemist in this area. NCEA has also commenced discussions with CRC Polymers with respect to this area. With appropriate funding it is hoped that further research can soon be carried out in this important area.

Figure 9 Applying Ciba PAM to the research tanks at USQ

4 Evaporation Control Systems – E-VapCap

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Research and development is still continuing with the Evaporation Control Systems (ECS) E-VapCap product. The current situation is that the technology is suitable for small storages less than one hectare in size. For larger storages a modular cell system is being developed, whereby each cell or rectangular portion of the cover is maintained in position using a cable grid system. There is also the option of not extending the cover right to the bank where bank erosion is likely to cause a silting problem.

Figure 4 E-VapCap cover working successfully on a one hectare vineyard storage in the Barossa

5 Netpro shadecloth

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Figure 5 Netpro shadecloth being installed across a crayfish storage at Marks Point, NSW

Netpro now have access to a newly commissioned shadecloth knitting machine located in Malaysia. The machine is able to produce a wider roll (14m instead of 6m) and this is expected to significantly reduce the cost of installation of shadecloth across water storages up to 10 hectares in size.

In recent communication with Netpro Ltd, Graham Minifie advised that with the larger roll, the cost of the cover material is expected to reduce by at least 44% and the total cost of covering a dam including installation would be expected to reduce by 25%.

6 Gale Pacific / CSIRO / East Gippsland Water project

The first project was reported upon by Hunter (2002) and involved the coverage of East Gippsland Water at Bemm River. The emphasis of the project was to minimise algae, weeds and/or vegetation and to minimise airborne contamination in addition to reducing evaporative loss. Results were very encouraging with impressive levels of algal and bacterial control demonstrated. Disinfection of the water was shown to be more efficient in the absence of algae, and contamination by bird droppings and airborne material were almost eliminated. The project has been followed with a further $ 0.5 million project covering a further five storage basins (Omea, Mallacoota, Clearwater, Swift Creek and Cann) in addition to a recycled water storage at Werribee. The shadecloth supplied by Gale Pacific was 97% lightproof and was installed by SuperSpan and AquaSpan Pty Ltd companies.

Figure 10 Installation of Gale Pacific shadecloth at Swift Creek dam (Vic) for algal control purposes

The following are some photos taken before and during construction of the structure in order to give you some appreciation of the task undertaken by East Gippsland Water and Super Span Pty Ltd:

Arrival of shadecloth on site

Pulling the shadecloth across the basin

Birds-eye view of tensioning the structure

The Super Span team demonstrating the strength of the structure!

Finished Structure!

Figure 11 Installation of a shadecloth cover, Victorian style !

7 Water Innovations – AquaGuard (hexagonal module)

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A modular floating impermeable hexagonal module with a hollow top chamber and a submerged bottom chamber which provides ballast. The chambers have an inclined transition to the outer edge to allow one module to easily slide off another if clustered and stacked by wind pressure. The modules will self arrange on the water surface, the closest pack arrangement covering between 79 – 96% of the water surface. The interlocking design is expected to make the cover highly storm resistant.

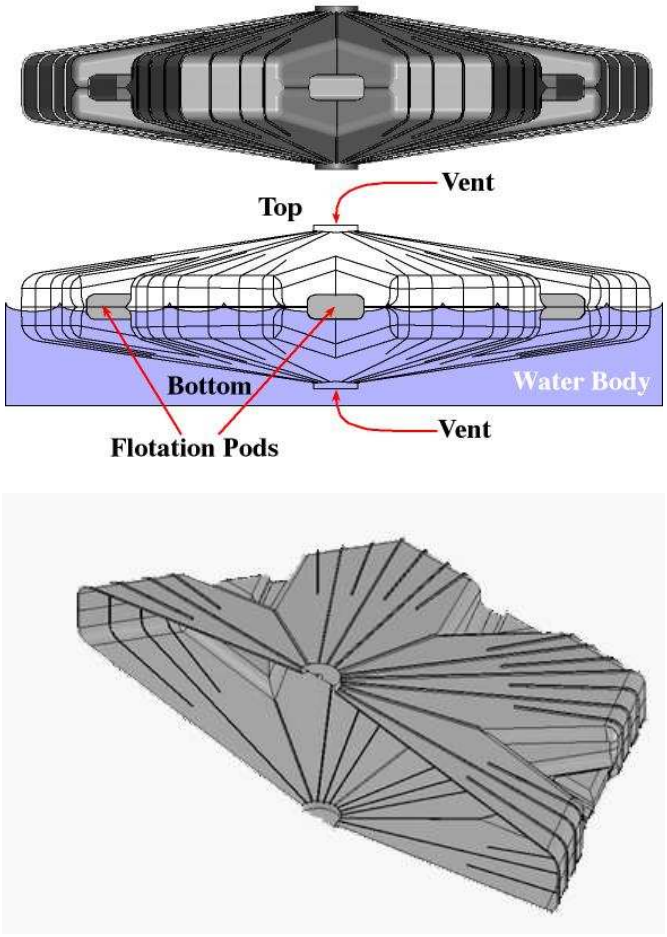

Figure 12 Prototype Water Innovations AquaGuard module

8 RMIT/ RioTinto – AquaCap

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AquaCaps modules are essentially plastic domes constructed of PVC, high tensile wire, bubble film and low density polypropylene. Ian Burston, a research engineer at RMIT has worked to develop and refine the design since 1994. The work included wind tunnel tests to overcome the problem of the modules over turning in high wind speeds. Initial field tests carried out at Pyramid Hill VIC revealed a 75% evaporation reduction figure. Rio Tinto Mining have recently invested in the injection moulding tools to produce a commercial prototype which is soon to be deployed at North Parkes Mine, NSW.

Figure 13 Prototype Aquacap modules being tested at Pyramid Hill, Vic

9 Integrated Packaging – Raftex

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The latest generation of these rafts are 2.1 x 2.1 m square, with approximately 2,000 rafts required to cover a hectare of water storage. Fabrication of the panels/rafts via a a timber framework arrangement is completed at the storage site. The main advantage of the system is that the cost is expected to be less than $3 per square metre.

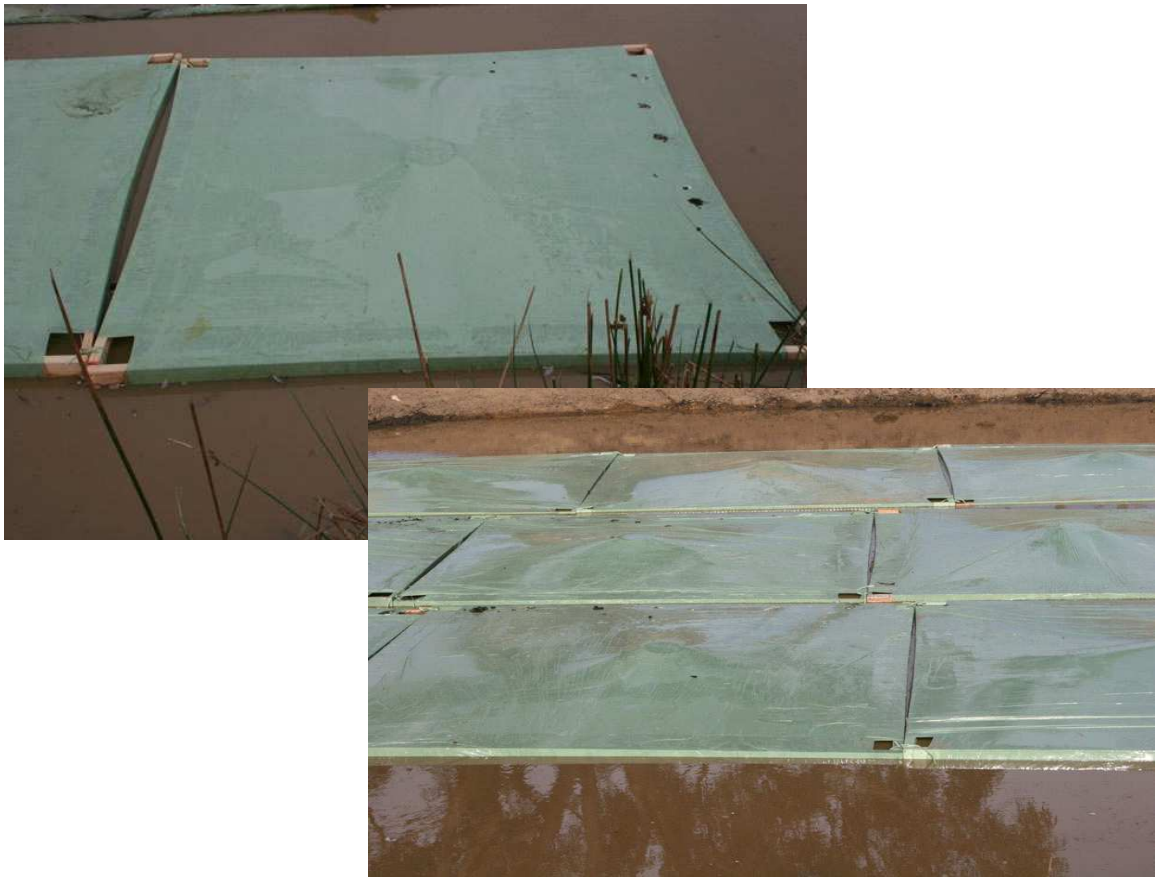

Figure 14 RafTex module from Integrated Packaging (F cubed), Melbourne